City of Brantford
Transportation Master Plan

APPENDIX G

Evaluation of Road Network Alternatives

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1 INTRODUCTION AND BACKGROUND

The City of Brantford is growing and is designated for growth in the Province of Ontario's "Places to Grow" Plan. The City is undertaking an integrated Official Plan Review and Transportation Master Plan Update to examine how best to accommodate growth in the future by developing policies and plans that will position Brantford as a great place to live and work.

The Transportation Master Plan Update was initiated by the City to review its transportation needs for the next 25 years, based on updated forecasts of future growth and changes to transportation patterns and infrastructure. The effectiveness of a series of transportation strategies (e.g. cycling, transit, TDM etc.) were examined based on their ability to respond to future transportation requirements and an attempt was made to solve the deficiencies as much as possible through non-automobile oriented solutions.

However, the findings of the Transportation Strategy Report also suggests that the even with an aggressive approach to encouraging future travel via non-auto transportation modes, there will still be a need for road improvements Therefore, a review and assessment of road improvement alternatives is required.

The City of Brantford already has a list of "Committed Projects" based on the City's, 5 year capital project forecast. In addition, the Ministry of Transportation also has some planned improvements on their provincial facilities within the City. These projects are expected to be built sometime within the 2031 planning horizon, although some may still be subject to obtaining necessary EA approvals. For the purpose of this Transportation Master Plan, these projects have been included as common improvements within all transportation networks being assessed.

The implementation of planned and committed projects will address some of the future transportation needs in the community; however, many of the road segments in the City will still be approaching or over capacity in 2031 with these improvements in place. Based on forecasts of future travel demands in 2031, new capacity may be required in a number of areas in the City, including:

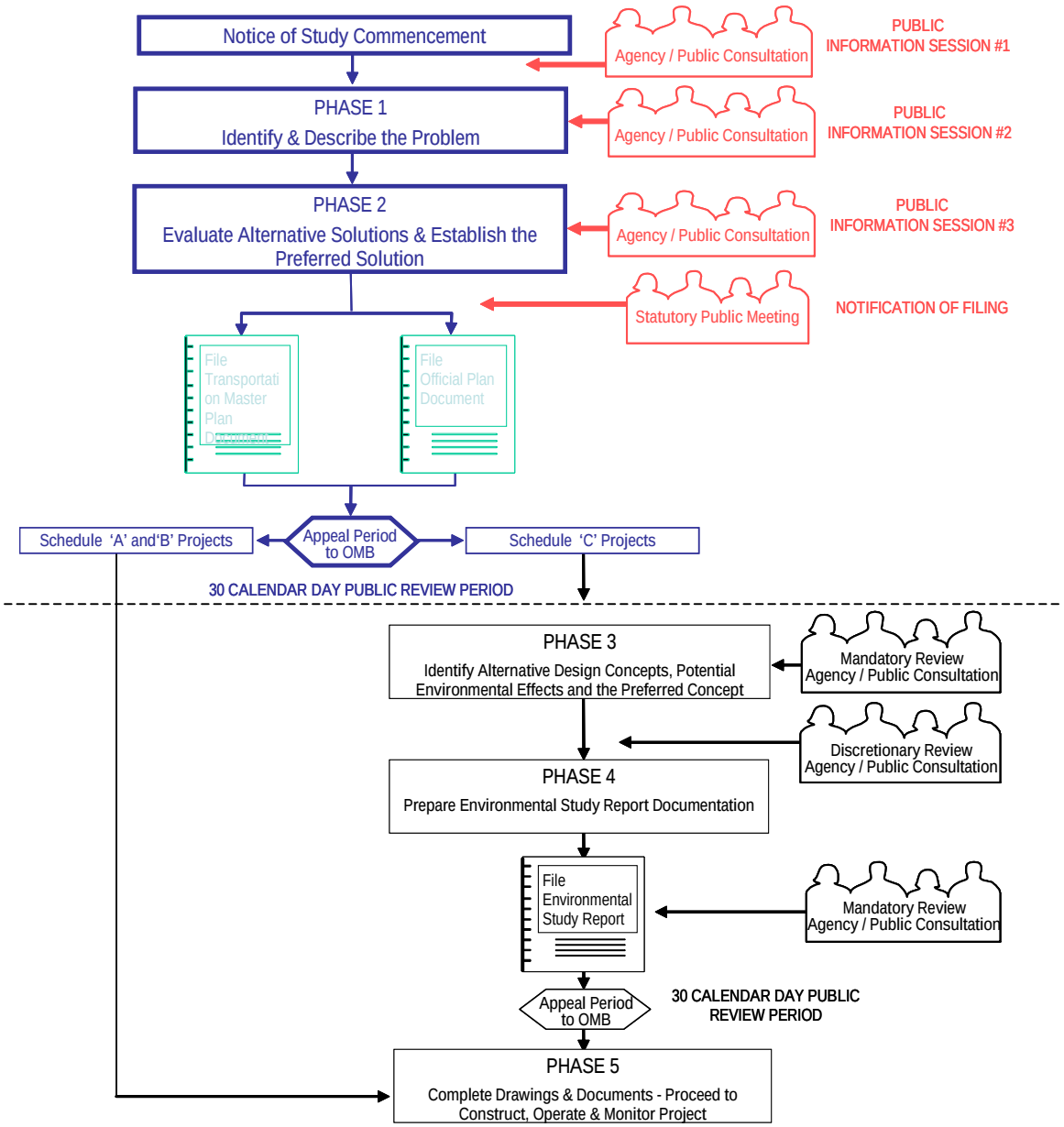
- East-West and/or North South across the Grand River,
- North / South across Highway 403 (particularly in the east end of the City),
- East /West across the West St. / Clarence St. corridors through the downtown,
- North / South across the CNR line in the east and west ends of the City, and
- East / West across Garden Ave.

This Report describes the process and criteria that will be used to evaluate alternative road network improvements that will ultimately form part of the City's Transportation Master Plan.

2 EVALUATION PROCESS

The Transportation Master Plan is being undertaken in accordance with the Municipal Class Environmental Assessment Process (2000), approved under the Environmental Assessment Act. There are five basic steps in the approved EA Process, as outlined in Figure 2.1, below.

Figure 2.1 Environmental Assessment Process – Master Plans



Within the context of a Master Planning Process, this project is intended to address the requirements of Phases 1 and 2 Municipal Class EA planning process, providing an assessment of the problem or opportunity and an assessment of alternative solutions. For projects recommended as part of the Master Plan that fall within the Schedule B category, approval of the Master Plan will constitute approval to proceed with the project. For more extensive Schedule C projects, with higher potential for environmental affects (both positive and negative), further project specific Environmental Assessment Studies may need to be completed by the City to examine alternative designs prior to implementation.

Under the EA Process, municipalities are required to consider all aspects of the environment in their assessment and evaluation of infrastructure projects. The EA Act includes a broad definition of the "environment", including the technical, natural, social, cultural, built and economic environments. The EA Process requires a systematic evaluation of alternatives in terms of their advantages and disadvantages; and proponents are required to consider both positive and negative effects on the natural, social, cultural, and economic environments as part of their assessment and evaluation process.

The evaluation process has been based on the three important evaluation objectives set by the Municipal Class EA Process:

Compatibility: The evaluation should rely on existing City and local policies/plan wherever possible in evaluation, so that the resulting recommendations are compatible with other municipal and agency plans in the short and medium terms (0-20 years), as well as the long term (20 years and beyond) where appropriate.

Traceability: The evaluation process should follow a logical, consistent evaluation process so that the rationale for the final recommendations can be traced through clear and complete documentation.

Objectivity: The evaluation process should be undertaken in objective manner, free of any pre-conceived answers.

2.1 Phase I: Need and Justification

Phase 1 of the Master Plan, established the need and justification for transportation improvements within the City of Brantford, based on the work completed during the evaluation of alternative land use scenarios that were developed to guide future growth in the City. This assessment and the resulting transportation issues were described in the *Transportation Assessment of Growth Scenarios* report.

This report recommended the adoption of a Compact City growth scenario, which complies with the Provincial "Places to Grow" legislation and provides the land use densities necessary to support and encourage increased transit use and other alternative transportation modes. Even with this move to a more compact urban form, the report also recognized the need for transportation improvements to address future mobility needs.

2.2 Phase II: Consideration of a Reasonable Range of Alternatives

Since the Master Planning process requires a review of the transportation infrastructure on a system-wide basis, the development and evaluation of alternative solutions is typically more extensive and holistic than that undertaken for project specific EA Studies. To build upon the "system-wide" approach to the development and evaluation of alternatives, Phase 2 was broken down into a series of steps, which combine to result in the preferred Solution. These steps, illustrated in Figure 2.2, are briefly described below:

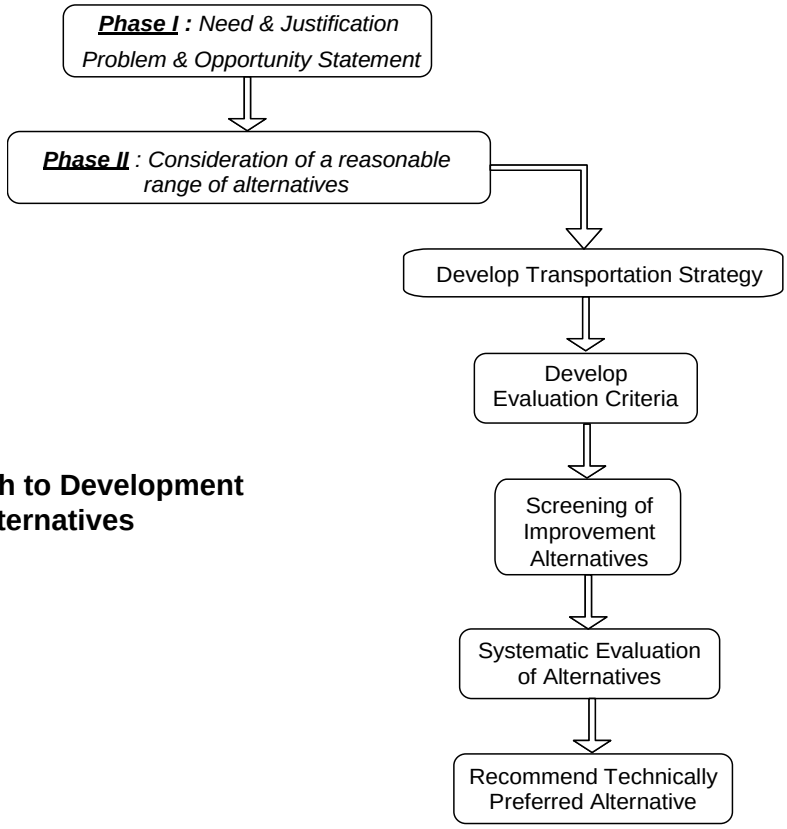


Figure 2.2 - Approach to Development and Evaluation of Alternatives

Step 1: Development of a Transportation Strategy – This initial step looked at the entire transportation system and all of the prevailing modes of travel used by Brantford residents today and in the future. Opportunities to improve transportation service and mobility, and reduce the need for new infrastructure was initially examined through a series of Transportation Strategy Alternatives, which examined the effectiveness of various policy based approaches in meeting future transportation needs. These included specific assessment of the potential future role of:

- Walking & Cycling,
- Parking Strategies in the downtown,
- Improvements to Transit Services,
- Optimization of the Existing Road Network,
- Transportation Demand Management programs,
- Truck Routes, and
- Road Network Improvements

Within each policy area, three general policy approaches were developed that reflect various levels of aggressiveness, investment, and reliance on non-auto based forms of transportation. An assessment of each policy alternative was undertaken based on a number of strategic objectives representing a combination of sustainability indicators and key objectives from the City of Brantford Strategic Plan. A full discussion of above is included in the report titled, *Development of a Transportation Strategy for the City of Brantford*. The assessment of Transportation Strategies was presented to the public at PIC 2, and public comments were incorporated into the development of a *Recommended Transportation Strategy*.

The recommended transportation strategy for the City includes:

- Walking and Cycling infrastructure, plans, and policies which initially focus on improving downtown and recreational connections, leading to implementation of a City-wide Multi-Use Trail and Bikeway system by 2031.
- Managing downtown parking supply and demand through an active program of new municipal parking lot construction combined with increased costs for longer term (all day) parking, to encourage use of alternative modes of travel for downtown trips.
- Transit System improvements that initially focus on improvements to service on key performing routes, leading to an extensive transit system upgrade by 2031, including trunk routes along major arterials, a doubling of the share of peak period trips using transit, and the establishment of additional transit terminal capacity in the downtown and north ends of the City.
- Optimization of the existing road network system through an aggressive program of intersection improvements, access management policies, signal system upgrades, and arterial road network capacity improvements designed to improve system wide arterial road capacity by up to 10% over the 25 year planning horizon.
- A targeted Transportation Demand Management Program aimed at developing formal TDM programs for some of the largest employers in the City, which will reduce 2031 peak hour auto demands by up to 5%.
- A Truck Routes System which utilizes permissive truck route signing combined with localized Truck Restrictions to encourage usage of appropriate roadways by truck traffic.
- A series of Road Network Improvements designed to ensure that the future road system can accommodate planned growth at a Level of Service D level or better by 2031.

Step 2: Development of Evaluation Criteria

The EA Act includes a broad definition of the “environment”, including the technical, natural, social, cultural, built and economic environments. The EA Process requires a systematic evaluation of alternatives in terms of their advantages and disadvantages; and proponents are required to consider both positive and negative effects on the natural, social, cultural, and economic environments as part of their assessment and evaluation process.

As part of the overall Public Consultation Strategy for the Transportation Master Plan and Official Plan Review, the proposed evaluation criteria and indicators for use in evaluating subsequent road improvement alternatives was presented to the public and comments were

requested. The evaluation criteria were grouped under the four key areas established as part of the Class EA process:

- Traffic and Transportation
- Socio-Cultural Environment
- Natural Environment; and
- Economic Environment

A detailed discussion of the evaluation criteria, indicators, and measures used is provided in section 2.3.

Step 3: Development of Alternative Road Network Improvements – Based on the projected travel demands and the effectiveness of the recommended transportation strategies, discussed above, road network improvements will still be required to ensure that the transportation system can accommodate 2031 peak hour travel demands.

The development of road network improvement alternatives must recognize that road network capacity deficiencies can either be created due to wide spread, systemic deficiencies (i.e. not enough lanes to carry peak direction flows) or localized deficiencies, caused by inefficient routing, localized demands in excess of capacity, or lack of access to/from key neighbourhoods. Often, improvements designed to address one problem can also benefit other problem areas in the City.

The process for identifying and assessing various road network improvement alternatives was therefore undertaken in a two step process.

Step 4: Screening of Road Network Improvements - The EA Process allows for a screening process to eliminate improvement alternatives that are not reasonable or do not address the problem or opportunity. Based on the projected capacity deficiencies at series of "screenlines" across the City, various improvement alternatives were developed to address each of these major deficiencies. The initial screening of road network improvements assessed how well each improvement alternative improved projected road network capacity deficiencies at key screenlines within the City.

This screening evaluation was set up as simple Pass/Fail test using two criteria:

1) Does the improvement solve the forecast screenline capacity deficiency?

2) Does the improvement solve other capacity deficiencies in the network?

Answering no to both of these questions suggests that the transportation improvement alternative has no "need and justification", and does not address the forecasted transportation capacity problems. These improvements, therefore, were dropped from further evaluation.

Step 5: Development of Alternative Road Network Improvements –For those improvements that pass the screening process, individual improvements were assembled into alternative networks; each designed to address previously identified road network deficiencies. The alternative networks include projects designed to resolve screenline capacity deficiencies as well as other improvements designed to resolve localized capacity deficiencies. Some of these localized improvements may be common to all or some alternative networks.

For the purpose of evaluation, each network alternative is subjected to a detailed comparative evaluation, using a "Reasoned Argument Process, which describes the advantages and disadvantages (or positive and negative affects) of each alternative in response to the evaluation criteria. Cumulative affects and benefits of all projects within the alternative are considered in the evaluation. Based on the descriptions provided, each alternative network is ranked in terms of how well it responds to the criteria. Opportunities to incorporate mitigation to offset potential adverse impacts are considered within this ranking process. This is commonly referred to a "Net Affects" evaluation.

Step 6: Comparative Evaluation of Alternatives

The comparative evaluation will rank each of the alternatives based on 5 measures of effectiveness, which range from Least Effective using an unshaded circle, to most effective, using a full shaded circle. Quarter, half, and three quarter shaded circles were also used where alternatives respond only slightly or moderately well to a criterion, respectively.

Unshaded Circle – The alternative is least effective in terms of the criteria and/or could have significant negative affects.
Quarter Circle – The alternative has minimal benefit in terms of the criteria and/or could result in moderate negative affects.
Half Circle – The alternative provides some minor benefit in terms of the criteria and could have minor negative affects (either localized or in terms of magnitude).
Three Quarter Circle – The alternative could have a noticeable benefit in terms of the criteria and would have modest negative affects that could be reduced or eliminated through standard mitigation measures.
Full Circle – The alternative would likely have significant benefits in terms of the criteria and/or minimal negative that could be reduced or eliminated through standard mitigation measures.

On the basis of this information, the alternatives were comparatively evaluated to select on balance, the alternative that has the most advantages and least disadvantages.

2.3 Evaluation Criteria & Indicators

The evaluation criteria used to assess road network improvement alternatives combines both quantitative and qualitative measures to compare and rank the alternatives.

Qualitative measures are used to describe the advantages and disadvantages for criteria that are not easily measured or incorporate a number of different considerations.

Quantitative measures compare the advantages and disadvantages for criteria in numeric terms, where the higher (or lower) value indicates a better score.

The criteria were developed recognizing the system-wide approach used in a Master Planning Study, and the fact that for many alternative improvements the specific route or design details are not developed at this stage of study. Detailed route planning or design is typically undertaken in Phase 3 of the EA process: Assessment of Design Alternatives. Thus, the evaluation compares the relative difference in potential affects that could be experienced as a result of the improvement rather than undertaking detailed assessments of specific affects, since the degree of impact could change significantly depending on the final route and / or design treatment chosen.

The following categories of consideration and their respective criteria are proposed for use in evaluating the growth:

Factor A: Transportation/Traffic

Criteria #1: Level of Transportation Service

This criterion assesses how well each alternative addresses the forecast capacity deficiencies at key screenlines in the City. The level of transportation service is defined in terms of the ratio of vehicle demand compared to road network capacity for all roadways crossing the screenline or on a specific series of links.

Criteria #2: *Network Travel Time*

This criterion measures the potential effectiveness of each alternative to enhance the level of transportation service on a network wide basis. Improvements to a transportation network may create a net increase/decrease in total travel time, which is a direct indicator of how well the network can serve local transportation needs in the movement of people and goods. Network travel time is quantified in terms of the total vehicle hours of travel through a roadway network in the PM peak hour (the time period used in the transportation model). The greater the vehicle hours of travel, the more congested the network.

Criteria #3: *Support for Transit / Non-Auto Modes*

This criteria is based on a qualitative assessment of the ability of each alternative to support other transportation modes (e.g. pedestrian, bicycle, transit, etc.).

A road network improvement can support alternative modes of transportation where the improvement has the potential ability to reduce travel time on transit routes or where the construction of a new route provides an opportunity to enhance continuity and connectivity for non-auto modes of travel, between key origin and destination points. For example, a new

river crossing may also reduce the walk/cycling distances between key origin and destination locations, improving the ability to attract some trip to alternative modes.

Criteria #4: Traffic Infiltration

This criterion evaluates the potential ability of each alternative to divert or reduce the amount of auto / commercial through traffic using local and collector residential streets. Traffic infiltration and "short cutting" typically occur in locations where there is significant congestion or unreasonable delays experienced on arterial roads. These impacts /benefit are measured from the transportation model in terms of *average vehicle kilometres* in the collector/local roadway network.

Factor B: Social / Cultural Environment

Criteria #5: *Impact on Neighbourhoods & Communities*

This is a qualitative assessment of the degree to which an alternative road improvement may affect existing neighbourhoods and or communities. Changes in function and dimensions of roadways may alter some fundamental characteristics of adjacent land uses, thereby impacting neighbourhood character or community fabric. Reduction in volume of auto and truck traffic though communities can also improve community liveability, safety in residential neighbourhoods, and increase the enjoyment of residential areas or communities.

Criteria #6: Potential Impacts to Agricultural /Resource Based Lands

This criterion compares the potential for different network improvements to affect designated agricultural/farm growing areas. This is estimated for comparison purposes based on *length of road (Km)* related to each network improvement alternative that is adjacent to / within designated agricultural/farm lands which are likely to be affected.

Criteria #7: *Potential Impacts to Heritage Resources/ archaeological features*

This criterion compares the potential for different network improvements to affect designated heritage resources or known/registered archaeological features. The potential for impacts associated with each alternative are quantified in terms of the *length of road (Km)* that is adjacent to / within designated heritage resources / archaeological areas.

Criteria #8: *Noise Levels*

This criterion compares the potential for different network improvements to affect nearby noise sensitive areas / land uses (i.e. residential communities, old age homes, hospitals and etc.). Predicting actual noise levels is dependant on traffic volumes and a number of roadway design and neighbourhood design characteristics. Since noise levels will vary based on traffic volumes it is also recognized that increased traffic on roads in one area of the city may reduce traffic volumes and noise levels in other areas of the City. Therefore this criteria uses a *qualitative assessment* to assess the potential for noise impacts associated with each alternative, considering increases in traffic volumes in areas with noise sensitive land uses.

Factor C: Natural Environment

Criteria #9: Affects to Designated Environmentally Sensitive Areas

This criterion assesses the relative affects of road network alternatives on designated Environmentally Sensitive Area (ESA's). Designated ESA's can be areas designated by provincial legislation, or designated within the City's Official Plan. Natural features such as watercourses, woodlots and parkland, and fauna/flora species could be affected by road

network improvements within or adjacent to the designated area. This occurs either by the direct removal of features or impacts caused by proximity of the road to the feature. This criterion is measured in terms of the *total length (km)* where network improvements are adjacent to/within designated Environmentally Sensitive Areas.

The evaluation of ecological impacts in the Transportation Master Plan is conducted at the system-wide master planning level, and accordingly does not address site-specific conditions, impacts or mitigation measures. The master planning evaluation highlights potential types of ecological impacts between various network alternatives, for comparative purposes only. Once the master plan selects a preferred network alternative, strategies to avoid, mitigate and/or compensate for ecological impacts will be addressed in subsequent Class Environmental Assessment processes for the design of specific projects. The provincial and federal EA process requires that where these impacts are expected, mitigation and/or compensation measures must be included as part of the project.

Criteria #10: Affects on Other Natural Areas

Network improvement may impinge upon or reduce the extent and quantity of other Natural Areas, which are not designated as Environmental Sensitive (i.e. watercourses, woodlots, linear parks, etc). This is evaluated based on the length (km) of network improvement adjacent to/within other natural features, watercourses, parklands and recreational areas.

Criteria #11: Affects on Air Quality

Increased traffic congestion and slower vehicle operating speeds can contribute to transportation related air quality problems due to higher levels of vehicle emissions than the same volume of traffic under efficient traffic conditions. Therefore, the ability of a network to improve travel speeds and minimize travel delays improves air quality compared to congested networks characterized by slower travel speeds and higher delays. These factors are estimated from the transportation model outputs based on veh-km of travel and average network speeds, and translate into network-wide estimates of *CO (Carbon Monoxide), VOC (Volatile Organic Compounds), and NOx (Nitrogen Oxide) levels*, assuming continuous prevalent use of fossil fuel and the internal combustion engine.

Criteria #12: Affects on Habitat Areas

This criterion assesses the potential for different network improvements to affect designated Wildlife or Fisheries Habitat Areas. This criterion will use a qualitative assessment of the potential for impact based on the proximity of a road improvement to a designated habitat area and/or the number of watercourses crossed by an improvement.

Factor D: Economic Environment Group

Criteria # 13: *Network Improvement Capital Cost*

The capital cost of a road network alternative is significant factor in a municipality's ability to fund long range transportation infrastructure needs. For the purpose of evaluation, typical order-of-magnitude capital cost estimates (in 2006 dollars) have been prepared for various types of road network improvements based on unit cost estimates for a project that is 1 km in length. Special items such as the costs for bridges, traffic signals, and engineering are

estimated separately. Capital cost estimates developed for the Transportation Master Plan do not include the cost of property acquisition since this level of cost estimate is highly dependant on the final alignment of the route and specific design features that are beyond the scope of this study.

The evaluation of Capital Cost therefore includes both the estimated construction costs, plus a qualitative rating reflecting the potential need for property acquisition associated with the improvement. This is especially important when comparing network alternatives that can be provided within an existing right-of-way to those requiring new transportation corridors.

Criteria #14: ***Use of Existing Infrastructure***

A key priority of City's Strategic Plan is to maximize the use of existing investments in the City's infrastructure. This has a impact on capital costs, as well as annual maintenance costs. Therefore, the ability of each alternative to make use of existing infrastructure is a key measure of how well an improvement reflects this strategic direction. This criterion is assessed based on a *qualitative* rating which considers operational improvements, and widening of existing facilities better than the construction of new facilities.

Criteria #15: *Potential Affects on Local Businesses*

This is a *qualitative* rating of the potential for adverse affects of road network improvement alternatives on existing businesses within the City or key commercial areas (such as the downtown).

Criteria #16: *Support for Future Employment Growth*

This is a *qualitative* measurement of the ability of road network alternatives to support future employment growth by providing high level of access and connectivity to the designated future employment land uses.

Table A-1 presents a summary of the evaluation criteria and indicators.

Table A-1 : Summary of Evaluation Criteria and Indicators.

Criteria	Indicator
Factor A: Transportation/Traffic	
Criteria #1: Change in level of transportation service	Composite *volume to capacity ratio* at screenlines
Criteria #2: Network Travel Time	Forecast *vehicle hours of travel* in the PM Peak period
Criteria #3: Support for Transit / Non-Auto Modes	*Qualitative* assessment of supportiveness of other transportation modes (e.g. pedestrian, bicycle, transit etc.)
Criteria #4: Traffic Infiltration	Increase/decrease in *average vehicle kilometres of travel via collector/local roadway network*.
Factor B: Social / Cultural Environment	
Criteria #5: Impact on Neighbourhoods & Communities	*Qualitative* rating of potential affects of each alternative on character and liveability of existing neighbourhoods
Criteria #6: Potential impact on Agricultural Resources	*Length (Km)* of road improvement adjacent to/within designated agricultural/farm lands.
Criteria #7: Potential impact on Heritage Resources and Archaeological Features	*Length (Km)* of road improvement adjacent to/within significant built heritage resources/ archaeological areas.
Criteria #8: Noise Levels	*Qualitative* assessment of potential for noise impacts associated with each alternative on noise sensitive land uses (i.e. residential neighbourhoods, old age homes, hospitals, etc).
Factor C: Natural Environment	
Criteria #9: Affects on Existing Environmentally Sensitive Areas	*Length (km)* of road improvements adjacent to/within designated Environmentally Sensitive Areas (ANSI, ESA, PSW, etc).
Criteria #10*:* Affects on Other Natural Areas	*Length (km)* of road improvements adjacent to/within other natural features, open spaces, watercourses, parklands and recreational areas.
Criteria #11: Affects on Air Quality	Network estimates of *CO, VOC, NOx* produced during PM Peak hour.
Criteria #12: Affects on Habitat Areas	*Qualitative* assessment of potential for affects on designated wildlife, fish / aquatic habitat areas.
Factor D: Economical Environment Group	
Criteria # 13**:** Network Improvement Capital Cost	*Capital cost estimate* of each alternative plus *Qualitative* assessment of potential for property acquisition.
Criteria #14*:* Use of Existing Infrastructure	*Qualitative* assessment of the degree with which a road network alternative makes use of existing transportation system capacity.
Criteria #15: Potential Affects on Local Businesses	*Qualitative* assessment of the potential for adverse affects on local businesses or key commercial areas.
Criteria #16: Support for Future Employment Growth	*Qualitative* assessment of the ability of road network alternatives to support future employment growth by improving access and connectivity to designated future employment areas.

2.4 Network Cost Estimates

For the purpose of the Transportation Master Plan, cost estimates for the road network improvement alternatives have been prepared to facilitate the evaluation process. Given the broad level of assessment that is typically undertaken in the Transportation Master Plan, detailed designs of the various network improvement alternatives will not be undertaken. Therefore, for the purpose of estimating capital costs, unit costs for various types of typical improvements have been developed. These unit costs will be used to estimate the total capital costs for each project based on the length of the project and other key assumptions, such as the need for new bridge structures. This approach is consistent with other Transportation Master Plans undertaken across the province.

For each generic improvement type, a unit cost estimate has been developed. For the road construction portions of projects, road widening or improvement costs have been developed for typical types of improvements and are expressed in terms of $/km. For new or widened structures a unit cost based on the size of the structure has been developed, and is expressed in terms of $/m2 of bridge deck. For other improvement types, such as new cycling lanes or multi-use trails, cost estimates have been developed on a per km basis as well. A number of 'specialized cost estimates' have also been developed to account for smaller localized improvements or components of larger projects that are not included in the generic unit cost estimates. An example of this would be for traffic signals at intersections, localized intersection improvements, and some environmental mitigation activities (such as Storm Water Management Ponds). The need for, number of, and /or location of these treatments would need to be confirmed / refined during the actual design of the project.

The unit cost estimates have been developed based on conceptual quantities for the major items that would be included in a each typical project, assuming a 1 km length. For road improvement projects, the only utility costs that have been included in the cost estimates is for storm sewer works, required for urban drainage design treatments. The costs for the purchase of property have not been included since detailed estimates of any required property would not be developed at this level of functional planning. Similarly, the costs for other utility work within a roadway corridor, such as water mains and sanitary sewers, have not been included in these estimates, yet it is recognized that the City may chose to complete these types of improvements at the same time as roadways are being reconstructed or widened.

The conceptual quantities developed for each improvement type were then compared to recent unit cost prices to estimate the cost of the improvement per km. Since this is only an order-of-magnitude cost estimate, only the major items for a typical project have been included. An allowance has been built in for the cost of minor items (15%) and a similar allowance has been built in for contingencies (15%). Engineering and Construction Administration costs have been estimated at 10% of capital costs estimates.

The following table summarizes the unit cost estimates that were developed for use in estimating the capital costs of the various road network improvement alternatives.

Summary of Capital Casts for Road Improvement Projects (/KM)

Category	Improvement Type	Unit	Estimated Cost
New Road Construction	4 Lane Rural Freeway	KM	$3,600,000
	2 Lane Rural Highway	KM	$1,600,000
	2 lane Urban Arterial	KM	$2,200,000
	4 lane Urban Arterial	KM	$2,800,000
	2 lane Urban Collector	KM	$1,800,000
Road Widening	2 Lane Rural Hwy Widening to 4 Lanes	KM	$1,500,000
	2 Lane Arterial Widening to 4 Lanes	KM	$2,000,000
	2 Lane Collector Widening to 4 Lanes	KM	$1,800,000
	4 Lane Arterial Widening to 5 lanes / CLTL	KM	$1,500,000
Operation/Intersections	Traffic Signals	each	$100,000
	Turning Lanes	each	$300,000
New Structure	New Short to Medium Span Structure	m^2	$1,800
	New Long-Span Structure (over 75m)	m^2	$2,800
	Structural Widening	m^2	$2,200
Miscellaneous	Sidewalks and multiuse trails	KM	$70,000
	Cycle lane within the driving lanes	KM	$560,000
	SWM	each	$100,000
	Engineering Design,EA,	Each	10% of Total Cost

2.4.1 Cost Estimates for Network Alternatives

The following tables summarize the cost estimates that were developed for each of the five road network improvement alternatives. Each of the alternatives includes the listed projects plus planned / committed projects that are currently included in the City's 5 year capital forecast.

These planned / committed projects are summarized below.

Committed Projects

- based on 5yr capital budget estimates

Project	Cost Estimate
King George Road TWLTL (Dunsdon to Tollgate)	$1,000,000
Shellard Lane Widening to 4 Lanes - BSAR to West City Limit	$4,000,000
BSAR Widening to 4 lanes -Mount Pleasant to Erie	$7,000,000
Clarence St TWLTL - Colborne to Dalhousie	$1,000,000
Henry St Widening to 4 Lanes - Wayne Gretzky Pkwy to Garden Ave	$4,000,000
Total	$17,000,000

Estimate for Road Network Improvement Alternative – 1

No	Project	Quantity	Unit Cost	Total	Notes
	BSAR Widening from 4 to 6 Lane from Shellard Lane to Erie Ave.	2.8			
	Roadways (per km)	2.8	$2,000,000	$5,600,000	
	Structure Widening (sqm)	825	$1,800	$1,485,000	110m span/7.5 m widening (2-lanes)
1-1	Intersections (each)	4	$190,000	$760,000	Provision of turning lanes/tapers
	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)			$200,000	1 SWM Pond @ 100KM
	Subtotal			$8,145,000	
	New 4-Lane Arterial from Erie Ave. to Rawdon St. (continuation of BSAR)	1.8			
	Roadways (per km)	1.20	$2,800,000	$3,360,000	
	New Railway Crossing Unser/Overpass Pass Structure	900	$1,800	$1,620,000	60m span/15m width (4-lanes)
1-2	Intersections (each)	3	$190,000	$570,000	Provision of turning lanes/tapers
	Traffic Signals	2	$100,000	$200,000	New or revised
	Environmental Mitigations (lump sum)			$400,000	SWM Pond / Noise Mitigation
	Subtotal			$6,150,000	
	Rawdon St. Widening from 2 to 4 Lanes from BSAR to Henry St.	2.4			
	Roadways (per km)	2.4	$2,000,000	$4,800,000	
	Railway Crossing Unser/Overpass Pass Structure Widening	400	$2,200	$880,000	20m span/20m widening (4-lanes)
1-3	Intersections (each)	6	$190,000	$1,140,000	Provision of turning lanes/tapers
	Traffic Signals	7	$100,000	$700,000	New or revised
	Environmental Mitigations (lump sum)			$100,000	
	Subtotal			$7,620,000	
	New 4 Lane Arterial from West St. to Rawdon St./Henry St (Charring Cross St. Continuation)	0.8			
	Roadways (per km)	0.8	$2,800,000	$2,240,000	
	New Railway Crossing Unser/Overpass Pass Structure	520	$2,200	$1,144,000	26m span/20m width (4-lanes)
1-4	Intersections (each)	1	$190,000	$190,000	Provision of turning lanes/tapers
	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)			$100,000	1 SWM Pond @ 100KM
	Subtotal			$3,774,000	
	New 4 Lane Arterial from Henry St. to WGP (Rawdon St. Continuation)	0.8			
	Roadways (per km)	0.8	$2,800,000	$2,240,000	
1-5	Intersections (each)	1	$300,000	$300,000	Provision of turning lanes/tapers
	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)			$100,000	1 SWM Pond @ 100KM
	Subtotal			$2,740,000	
	WGP Widening from 4 to 6 Lanes from Henry St. to Lynden Road	2.1			
	Roadways (per km)	2.1	$2,000,000	$4,200,000	
	Structure Widening (sqm)	950	$2,200	$2,090,000	80m span/12 m widening (2-lanes)
1-6	Railway Crossing Unser/Overpass Pass Structure Widening	450	$1,800	$810,000	60m span/7.5m widening (2-lanes)
	Intersections (each)	0	$190,000	$0	Provision of turning lanes/tapers
	Traffic Signals	5	$100,000	$500,000	New or revised
	Interchange Ramp Reconstruction			$500,000	
	Subtotal			$8,100,000	
	Queensway Dr. Widening from 2 to 4 Lanes from Paris Rd. to King George Rd.	1.2			
	Roadways (per km)	1.2	$1,800,000	$2,160,000	
1-7	Intersections (each)	1	$190,000	$190,000	Provision of turning lanes/tapers
	Traffic Signals	2	$100,000	$200,000	New or revised
	Environmental Mitigations (lump sum)				
	Subtotal			$2,550,000	
	Toll Gate Rd. Widening from 2 to 4 Lanes from St. George St. to Norman St./Summerset Rd.	0.4			
	Roadways (per km)	0.4	$2,000,000	$800,000	
	Structure Widening (sqm)	500	$2,200	$1,100,000	67m span/7.5m widening (2-lanes)
1-8	Intersections (each)		$190,000	$0	Provision of turning lanes/tapers
	Traffic Signals		$100,000	$0	New or revised
	Environmental Mitigations (lump sum)				
	Subtotal			$1,900,000	
	North Park Rd. Capacity Up-Grade from Charring Cross St. to Memorial Dr.	1.6			
1-9	Intersections (each)	4	$190,000	$760,000	Provision of turning lanes/tapers
	Traffic Signals	3	$100,000	$300,000	New or revised
	Subtotal			$1,060,000	
	Memorial Dr. Capacity Up-Grade from North Park St. to Power Line Rd.	2.1			
1-10	Intersections (each)	4	$190,000	$760,000	Provision of turning lanes/tapers
	Traffic Signals	4	$100,000	$400,000	New or revised
	Subtotal			$1,160,000	
	New 2-Lane Arterial from Power Line Rd. to King George Rd. / Memorial Dr. Continuation	1.3			
	Roadways (per km)	1.3	$2,200,000	$2,860,000	
1-11	Intersections (each)	2	$190,000	$380,000	Provision of turning lanes/tapers
	Traffic Signals	2	$100,000	$200,000	New or revised
	Environmental Mitigations (lump sum)			$200,000	2 SWM Pond @ 100KM
	Subtotal			$3,640,000	
	New 2-Lane Arterial from Power Line Rd. to Park Rd. N. / WGP Continuation	0.6			
	Roadways (per km)	0.6	$2,200,000	$1,320,000	
1-12	Intersections (each)	2	$190,000	$380,000	Provision of turning lanes/tapers
	Traffic Signals	2	$100,000	$200,000	New or revised
	Environmental Mitigations (lump sum)			$100,000	
	Subtotal			$2,000,000	
	Total Length	17.9 km			Road Work
	Total Construction Cost			$49,000,000	
	Engineering	5%		$2,450,000	EA - Detail Design
	Total Cost			$51,450,000	Excluding Property Acquisition

Estimate for Road Network Improvement Alternative – 2

No	Project	Quantity	Unit Cost	Total	Notes
	New 4 Lane Arterial from Hardy Rd./Oak Park Rd. to Colborne St. W	4.2			
	Roadways (per km)	4.2	$2,800,000	$11,760,000	
	New Structure (sqm)	4,500	$2,800	$12,600,000	250m span/18 m width(4-lanes)
2-1	Intersections (each)	4	$190,000	$760,000	Provision of turning lanes/tapers
	Traffic Signals	3	$100,000	$300,000	New or revised
	Environmental Mitigations (lump sum)			$300,000	1 SWM Pond @ 100KM + Fisheries
	Subtotal			$25,720,000	
	Widening of Existing Oak Park Road - Hardy Rd to N of Highway 403	1.4	$2,000,000	$2,800,000	
	Structure Widening (sqm)	950	$2,200	$2,090,000	80m span/12 m widening (2-lanes)
	Interchange Ramp Reconstruction			$1,000,000	
				$5,890,000	
	Terrace Hill St Widening from 2 to 4 Lanes from Paris Rd. to West St.	1.9			
	Roadways (per km)	1.90	$2,000,000	$3,800,000	
2-2	Intersections (each)	4	$190,000	$760,000	Provision of turning lanes/tapers
	Traffic Signals	4	$100,000	$400,000	New or revised
	Environmental Mitigations (lump sum)				
	Subtotal			$4,960,000	
	New 4 Lane Arterial from West St. to Rawdon St./Henry St (Charring Cross St. Continuation)	0.8			
	Roadways (per km)	0.8	$2,800,000	$2,240,000	
2-3	New Railway Crossing Unser/Overpass Pass Structure	520	$2,200	$1,144,000	26m span/20m width (4-lanes)
1-4	Intersections (each)	1	$190,000	$190,000	Provision of turning lanes/tapers
	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)			$100,000	1 SWM Pond @ 100KM
	Subtotal			$3,774,000	
	New 4 Lane Arterial from BSAR/Market St. to Glenwood Dr./WGP (BSAR Extension)	2.7			
	Roadways (per km)	2.7	$2,800,000	$7,560,000	
2-4	New Railway Crossing Unser/Overpass Pass Structure	400	$1,800	$720,000	60m span/15m width (4-lanes)
	Intersections (each)	5	$190,000	$950,000	Provision of turning lanes/tapers
	Traffic Signals	3	$100,000	$300,000	New or revised
	Environmental Mitigations (lump sum)			$600,000	SWM / Noise Mitigation
	Subtotal			$10,130,000	
	WGP Widening from 4 to 6 Lanes from Colborne St. to Lynden Road	3.6			
	Roadways (per km)	3.6	$2,000,000	$7,200,000	
	Structure Widening (sqm)	950	$2,200	$2,090,000	80m span/12 m widening (2-lanes)
2-5	Railway Crossing Unser/Overpass Pass Structure Widening	450	$1,800	$1,620,000	60m span/7.5m widening (2-lanes)
	Intersections (each)	0	$190,000	$0	Provision of turning lanes/tapers
	Traffic Signals	9	$100,000	$900,000	New or revised
	Interchange Ramp Reconstruction			$500,000	
	Subtotal			$12,310,000	
	Grey St. Capacity Up-Grade (to Minor Arterial) from WGP to James St.	0.7			
	Intersections (each)	2	$190,000	$380,000	Provision of turning lanes/tapers
2-6	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)				
	Subtotal			$480,000	
	New 2-Lane Arterial to Connect Grey St. from James St. to Rowanwood Ave.	0.6			
	Roadways (per km)	0.6	$2,200,000	$1,320,000	
2-7	Intersections (each)	1	$190,000	$190,000	Provision of turning lanes/tapers
	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)			$100,000	1 SWM Pond @ 100KM
	Subtotal			$1,710,000	
	Grey St. Capacity Up-Grade (to Minor Arterial) from Rowanwood Ave. to Garden Ave.	1			
	Intersections (each)	1	$190,000	$190,000	Provision of turning lanes/tapers
2-8	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)				
	Subtotal			$290,000	
	Toll Gate Rd. Widening from 2 to 4 Lanes from St. George St. to Norman St./Summerset Rd.	0.4			
	Roadways (per km)	0.4	$2,000,000	$800,000	
2-9	Structure Widening (sqm)	500	$2,200	$1,100,000	67m span/7.5m widening (2-lanes)
1-8	Intersections (each)		$190,000	$0	Provision of turning lanes/tapers
	Traffic Signals		$100,000	$0	New or revised
	Environmental Mitigations (lump sum)				
	Subtotal			$1,900,000	
	Total Length	15.9 km			Road Work
	Total Construction Cost			$67,000,000	
	Engineering	5%		$3,350,000	EA - Detail Design
	Total Cost			$70,350,000	Excluding Property Acquisition

Estimate for Road Network Improvement Alternative – 3

No	Project	Quantity	Unit Cost	Total	Notes
	New 4 Lane Arterial from Colborne St. W to Grand River Ave.	1.2			
	Roadways (per km)	1.2	$2,800,000	$3,360,000	
	Structure Widening (sqm)	7,200	$2,800	$20,160,000	400m span/18 m width(4-lanes)
3-1	Intersections (each)	1	$190,000	$190,000	Provision of turning lanes/tapers
	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)			$500,000	SWM / Fisheries
	Subtotal			$24,310,000	
	St. Paul Ave. Widening from 4 to 6 Lanes from Brant Ave. to King George Rd.	1			
	Roadways (per km)	1.00	$2,000,000	$2,000,000	
	Railway Crossing Unser/Overpass Pass Structure Widening	900	$2,200	$3,960,000	Replace Ex Subway (30m x 30 m)
3-2	Intersections (each)	4	$190,000	$760,000	Provision of turning lanes/tapers
	Traffic Signals	4	$100,000	$400,000	New or revised
	Environmental Mitigations (lump sum)			$200,000	
	Subtotal			$7,320,000	
	St. Paul Ave. Widening from 2 to 4 Lanes from Grand River Ave to Brant Ave.	1			
	Roadways (per km)	1.00	$2,000,000	$2,000,000	
	Railway Crossing Unser/Overpass Pass Structure Widening		$1,800	$0	At grade crossing
3-3	Intersections (each)	2	$190,000	$380,000	Provision of turning lanes/tapers
	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)			$200,000	
	Subtotal			$2,680,000	
	Rawdon St. Widening from 2 to 4 Lanes from Colborne. to Henry St.	1.1			
	Roadways (per km)	1.1	$2,000,000	$2,200,000	
	Railway Crossing Unser/Overpass Pass Structure Widening	400	$2,200	$1,760,000	20m span/20m widening (4-lanes)
3-4	Intersections (each)	6	$190,000	$1,140,000	Provision of turning lanes/tapers
	Traffic Signals	6	$100,000	$600,000	New or revised
	Environmental Mitigations (lump sum)			$100,000	
	Subtotal			$5,800,000	
	King George Rd. Widening from 4 to 6 Lanes with a TWLTL from St. Paul Ave. to Powerline Rd.	3.1			
	Roadways (per km)	3.1	$2,600,000	$8,060,000	
	Structure Widening (sqm)	700	$2,200	$1,540,000	70m span/10m widening (2-lanes+ SW)
3-5	Intersections (each)	0	$190,000	$0	included with TWLTL
	Traffic Signals	15	$100,000	$1,500,000	New or revised
	Environmental Mitigations (lump sum)				
	Subtotal			$11,100,000	
	Dundas St Widening from 2 to 4 Lanes from St. Paul Ave. to West St.	1.2			
	Roadways (per km)	1.2	$2,000,000	$2,400,000	
3-6	Intersections (each)	1	$190,000	$190,000	Provision of turning lanes/tapers
	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)			$100,000	1 SWM Pond @ 100KM
	Subtotal			$2,790,000	
	Rawdon St. Widening from 2 to 4 Lanes from Colborne St. to Henry St.	1.6			
	Roadways (per km)	1.6	$2,000,000	$3,200,000	
	Railway Crossing Unser/Overpass Pass Structure Widening	400	$2,200	$880,000	20m span/20m widening (4-lanes)
3-7	Intersections (each)	6	$190,000	$1,140,000	Provision of turning lanes/tapers
	Traffic Signals	7	$100,000	$700,000	New or revised
	Environmental Mitigations (lump sum)			$100,000	
	Subtotal			$6,020,000	
	New 4 Lane Arterial from West St. to Rawdon St./Henry St (Charring Cross St. Continuation)	0.8			
	Roadways (per km)	0.8	$2,800,000	$2,240,000	
3-8	New Railway Crossing Unser/Overpass Pass Structure	520	$2,200	$1,144,000	26m span/20m width (4-lanes)
1-4	Intersections (each)	1	$190,000	$190,000	Provision of turning lanes/tapers
	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)			$100,000	1 SWM Pond @ 100KM
	Subtotal			$3,774,000	
	West Street Widening from 4 to 6 Lanes from Charring Cross St. to Lynden Road/Fairview Dr.	2			
	Roadways (per km)	2.0	$2,000,000	$4,000,000	
	Structure Widening (sqm)	600	$2,200	$1,320,000	67m span/9.0m widening (4-lanes)
3-9	Intersections (each)	5	$190,000	$950,000	Provision of turning lanes/tapers
	Traffic Signals	5	$100,000	$500,000	New or revised
	Environmental Mitigations (lump sum)			$100,000	
	Subtotal			$6,870,000	
	Park Rd. N. . Widening from 2 to 4 Lanes from Dusndon St. to Powerline Rd.	0.9			
	Roadways (per km)	0.9	$2,000,000	$1,800,000	
3-10	Intersections (each)	2	$190,000	$380,000	Provision of turning lanes/tapers
	Traffic Signals	2	$100,000	$200,000	New or revised
	Environmental Mitigations (lump sum)	1	$100,000	$100,000	1 SWM Pond @ 100KM
	Subtotal			$2,480,000	
	Total Length	12.9 km			Road Work
	Total Construction Cost			$73,000,000	
	Engineering	5%		$3,650,000	EA - Detail Design
	Total Cost			$76,650,000	Excluding Property Acquisition

Estimate for Road Network Improvement Alternative – 4

No	Project	Quantity	Unit Cost	Total	Notes
	BSAR Widening from 4 to 6 Lane from Shellard Lane to Erie Ave.	2.8			
	Roadways (per km)	2.8	$2,000,000	$5,600,000	
	Structure Widening (sqm)	825	$1,800	$1,485,000	110m span/7.5 m widening (2-lanes)
4-1	Intersections (each)	4	$190,000	$760,000	Provision of turning lanes/tapers
	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)			$200,000	1 SWM Pond @ 100KM
	Subtotal			$8,145,000	
	Clarence St. Widening from 4 to 5 Lanes (TWLTL) from Corborne St. to Henry St.	1.5			
	Roadways (per km)	1.50	$1,500,000	$2,250,000	
	Railway Crossing Unser/Overpass Pass Structure Widening	0	$1,800	$0	narrow at ex crossing
4-2	Intersections (each)	0	$190,000	$0	incl in TWLTL
	Traffic Signals	6	$100,000	$600,000	New or revised
	Clarence / West St Realignment			$800,000	
	Subtotal			$3,650,000	
	Dundas St Widening from 2 to 4 Lanes from St. Paul Ave. to West St.	1.2			
	Roadways (per km)	1.2	$2,000,000	$2,400,000	
4-3	Intersections (each)	3	$190,000	$570,000	Provision of turning lanes/tapers
3-5	Traffic Signals	2	$100,000	$200,000	New or revised
	Environmental Mitigations (lump sum)			$100,000	
	Subtotal			$3,270,000	
	Elgin St Widening from 2 to 4 Lanes from Clarence St. to Garden Ave.	4.4			
	Roadways (per km)	2.4	$2,000,000	$4,800,000	WGP - Garden Ave
	Railway Crossing Unser/Overpass Pass Structure Replacement	600	$2,200	$2,640,000	60m span/10m replacement (4-lanes)
4-4	Intersections (each)	6	$190,000	$1,140,000	Provision of turning lanes/tapers
	Traffic Signals	5	$100,000	$500,000	New or revised
	Environmental Mitigations (lump sum)			$300,000	
	Subtotal			$9,380,000	
	New 4 Lane Arterial from Garden Ave. to County Rd. # 18 (Elgin St. Continuation)	0.48			
	Roadways (per km)	0.48	$2,800,000	$1,344,000	
4-5	Intersections (each)	1	$190,000	$190,000	Provision of turning lanes/tapers
	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)			$100,000	1 SWM Pond @ 100KM
	Subtotal			$1,734,000	
	West Street Widening from 4 to 6 Lanes from Charring Cross St. to Lynden Road/Fairview Dr.	2			
	Roadways (per km)	2.0	$2,000,000	$4,000,000	
	Structure Widening (sqm)	600	$2,200	$1,320,000	67m span/9.0m widening (4-lanes)
4-6	Intersections (each)	5	$190,000	$950,000	Provision of turning lanes/tapers
	Traffic Signals	5	$100,000	$500,000	New or revised
	Environmental Mitigations (lump sum)			$100,000	
	Subtotal			$6,870,000	
	Balmoral Dr. Capacity Up-Grade from toll Gate Rd. to Poweline Rd.	2.05			
	Intersections (each)	5	$190,000	$950,000	Provision of turning lanes/tapers
4-7	Traffic Signals	4	$100,000	$400,000	New or revised
	Environmental Mitigations (lump sum)				
	Subtotal			$1,350,000	
	New 2 Lane Arterial from Poweline Rd. to King George Rd. (Balmoral Dr. Continuation)	2.1			
	Roadways (per km)	2.1	$2,200,000	$4,620,000	
4-8	Intersections (each)	1	$190,000	$190,000	Provision of turning lanes/tapers
	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)			$100,000	
	Subtotal			$5,010,000	
	Park Rd. N. . Widening from 2 to 4 Lanes from Dusndon St. to Powerline Rd.	0.9			
	Roadways (per km)	0.9	$2,000,000	$1,800,000	
4-9	Intersections (each)	2	$190,000	$380,000	Provision of turning lanes/tapers
	Traffic Signals	2	$100,000	$200,000	New or revised
	Environmental Mitigations (lump sum)	1	$100,000	$100,000	1 SWM Pond @ 100KM
	Subtotal			$2,480,000	
	Total Length	17.43 km			Road Work
	Total Construction Cost			$42,000,000	
	Engineering	5%		$2,100,000	EA - Detail Design
	Total Cost			$44,100,000	Excluding Property Acquisition

Estimate for Road Network Improvement Alternative – 5 (Hybrid)

No	Project	Quantity	Unit Cost	Total	Notes
	New 4 Lane Arterial from Hardy Rd./Oak Park Rd. to Colborne St. W	4.2			
	Roadways (per km)	4.2	$2,800,000	$11,760,000	
	New Structure (sqm)	4,500	$2,800	$12,600,000	250m span/18 m width(4-lanes)
2-1	Intersections (each)	4	$190,000	$760,000	Provision of turning lanes/tapers
	Traffic Signals	3	$100,000	$300,000	New or revised
	Environmental Mitigations (lump sum)			$300,000	1 SWM Pond @ 100KM + Fisheries
	Subtotal			$25,720,000	
	Widening of Existing Oak Park Road - Hardy Rd to N of Highway 403	1.4	$2,000,000	$2,800,000	
	Structure Widening (sqm)	950	$2,200	$2,090,000	80m span/12 m widening (2-lanes)
	Interchange Ramp Reconstruction			$1,000,000	
				$5,890,000	
	Brant Ave. Capacity Upgrade (remove on-street parking) from St. Paul to Dalhousie	1.52			
	Intersections (each)	3	$190,000	$570,000	Provision of turning lanes/tapers
5-2	Traffic Signals	2	$100,000	$200,000	New or revised
	Environmental Mitigations (lump sum)				
	Subtotal			$770,000	
	New 4 Lane Arterial from BSAR/Market St. to Glenwood Dr./WGP (BSAR Extension)	2.7			
	Roadways (per km)	2.7	$2,800,000	$7,560,000	
	New Railway Crossing Unser/Overpass Pass Structure	400	$1,800	$720,000	60m span/15m width (4-lanes)
2-4	Intersections (each)	5	$190,000	$950,000	Provision of turning lanes/tapers
	Traffic Signals	3	$100,000	$300,000	New or revised
	Environmental Mitigations (lump sum)			$600,000	SWM / Noise Mitigation
	Subtotal			$10,130,000	
	WGP Widening from 4 to 6 Lanes from Colborne St. to Lynden Road	3.6			
	Roadways (per km)	3.6	$2,000,000	$7,200,000	
	Structure Widening (sqm)	950	$2,200	$2,090,000	80m span/12 m widening (2-lanes)
2-5	Railway Crossing Unser/Overpass Pass Structure Widening	450	$1,800	$1,620,000	60m span/7.5m widening (2-lanes)
	Intersections (each)	0	$190,000	$0	Provision of turning lanes/tapers
	Traffic Signals	9	$100,000	$900,000	New or revised
	Interchange Ramp Reconstruction			$500,000	
	Subtotal			$12,310,000	
	New 2-Lane Arterial from Hwy 24 to WGP/ North Connection Rd	2.8			
	Roadways (per km)	2.8	$2,200,000	$6,160,000	
5-5	Intersections (each)	3	$190,000	$570,000	Provision of turning lanes/tapers
	Traffic Signals	3	$100,000	$300,000	New or revised
	Environmental Mitigations (lump sum)			$300,000	SWM
	Subtotal			$7,330,000	
	New 4 Lane Arterial from West St. to Rawdon St./Henry St (Charring Cross St. Continuation)	0.8			
	Roadways (per km)	0.8	$2,800,000	$2,240,000	
	New Railway Crossing Unser/Overpass Pass Structure	520	$2,200	$1,144,000	26m span/20m width (4-lanes)
1-4	Intersections (each)	1	$190,000	$190,000	Provision of turning lanes/tapers
	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)			$100,000	1 SWM Pond @ 100KM
	Subtotal			$3,774,000	
	Toll Gate Rd. Widening from 2 to 4 Lanes from St. George St. to Norman St./Summerset Rd.	0.4			
	Roadways (per km)	0.4	$2,000,000	$800,000	
	Structure Widening (sqm)	500	$2,200	$1,100,000	67m span/7.5m widening (2-lanes)
1-8	Intersections (each)		$190,000	$0	Provision of turning lanes/tapers
	Traffic Signals		$100,000	$0	New or revised
	Environmental Mitigations (lump sum)				
	Subtotal			$1,900,000	
	Grey St. Capacity Up-Grade (to Minor Arterial) from WGP to James St.	0.74			
	Intersections (each)	2	$190,000	$380,000	Provision of turning lanes/tapers
2-6	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)				
	Subtotal			$480,000	
	New 2-Lane Arterial to Connect Grey St. from James St. to Rowanwood Ave.	0.6			
	Roadways (per km)	0.6	$2,200,000	$1,320,000	
2-7	Intersections (each)	1	$190,000	$190,000	Provision of turning lanes/tapers
	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)			$100,000	1 SWM Pond @ 100KM
	Subtotal			$1,710,000	
	Grey St. Capacity Up-Grade (to Minor Arterial) from Rowanwood Ave. to Garden Ave.	1			
	Intersections (each)	1	$190,000	$190,000	Provision of turning lanes/tapers
2-8	Traffic Signals	1	$100,000	$100,000	New or revised
	Environmental Mitigations (lump sum)				
	Subtotal			$290,000	
	New 2-Lane Connection from Grey St. to Elgin St.	0.43			
	Roadways (per km)	0.43	$2,200,000	$946,000	
5–11	Intersections (each)	2	$190,000	$380,000	Provision of turning lanes/tapers
	Traffic Signals	1	$100,000	$100,000	New or revised
	Rail X-ing at Grade			$100,000	
	Subtotal			$1,526,000	
	Total Length	18.79 km			Road Work
	Total Construction Cost			$72,000,000	
	Engineering	5%		$3,600,000	EA - Detail Design
	Total Cost			$75,600,000	Excluding Property Acquisition

2.5 Detailed Evaluation Results

The attached tables summarize the evaluation of the five network alternatives and highlight the positive and negative aspects of each alternative. The alternatives are ranked, using the evaluation methodology discussed previously, in terms of which alternative best satisfies the criteria or has the least potential for adverse impacts.

The evaluation is based on 5 measures of effectiveness, which range from Least Effective using an unshaded circle, to most effective, using a full shaded circle. Quarter, half, and three quarter shaded circles were also used where alternatives respond only slightly or moderately well to a criterion, respectively.

Unshaded Circle – The alternative is least effective in terms of the criteria and/or could have significant negative affects.
Quarter Circle – The alternative has minimal benefit in terms of the criteria and/or could result in moderate negative affects.
Half Circle – The alternative provides some minor benefit in terms of the criteria and could have minor negative affects (either localized or in terms of magnitude).
Three Quarter Circle – The alternative could have a noticeable benefit in terms of the criteria and would have modest negative affects that could be reduced or eliminated through standard mitigation measures.
Full Circle – The alternative would likely have significant benefits in terms of the criteria and/or minimal negative that could be reduced or eliminated through standard mitigation measures.

On the basis of this information, the alternatives were comparatively evaluated to select on balance, the alternative that has the most advantages and least disadvantages.